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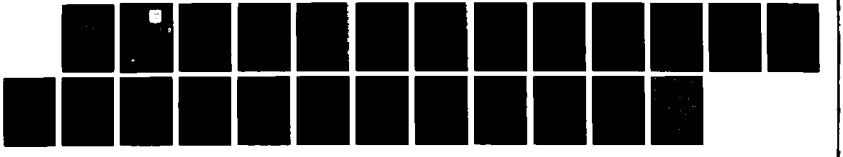

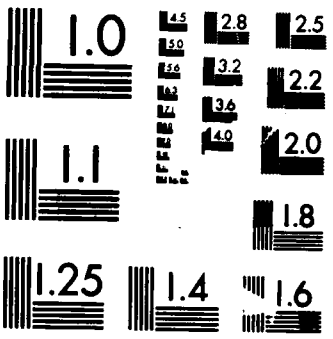

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STUDENT ESSAY

ARMY AIRCRAFT MAINTENANCE PROBLEMS

BY

LIEUTENANT COLONEL GERALD P. KOKENES

13 MARCH 1987

US ARMY WAR COLLEGE, CARLISLE BARRACKS, PENNSYLVANIA

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Procedures for developing a force structure to maintain modern Army aircraft in peacetime and in war are not adequate and must be refined. They must be more accurate and more timely so as to pinpoint the cost of manpower

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The Army aviation community is exploring issues to improve its ability to further maintain Army aircraft especially new systems beginning with the Blackhawk and Apache.

TRADOC is conducting an on-going study to determine fixes to the present system. This study examines current issues and provides recommendations to the Army that would correct aircraft maintenance system flaws.

USAWC MILITARY STUDIES PROGRAM PAPER

ARMY AIRCRAFT MAINTENANCE PROBLEMS

An Individual Essay

by

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ABSTRACT

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Procedures for developing a force structure to maintain modern Army aircraft in peacetime and in war are not adequate and must be refined. They must be more accurate and more timely so as to pinpoint the cost of manpower to maintain new systems and they must clearly show the need to resource maintenance of these vital systems even when uniformed manpower is not available.

The Army aviation community is exploring issues to improve its ability to further maintain Army aircraft especially new systems beginning with the Blackhawk and Apache.

TRADOC is conducting an on-going study to determine fixes to the present system. This study examines current issues and provides recommendations to the Army that would correct aircraft maintenance system flaws.

Keywords: aircraft maintenance; maintenance management; issues

INTRODUCTION

The Army's modernization thrust which began in the 70's and is in full swing today, will greatly advance readiness and the United States' ability to combat threats around the world. And there is much more to come. There are still requirements in all areas that must be developed into organizational, doctrinal, and material solutions for the Army to be effective in its deterence effort and totally prepared for direct conflict.

The Army has made many changes during this modernization in organizations and in doctrine, but the most significant changes have been made in new equipment. New systems include the Abrams tank, the Bradley fighting vehicle, the SINGARS radio, the TACCS computer for command and control and logistics and a totally new generation of helicopters. The modernization of the Army's helicopter fleet has seen fielding of the UH-60 Blackhawk, the AH-64 Apache, modernization of the CH-47 to an all new configuration, CH-47D and modernization of the OH-58 to an advanced scout aircraft, OH-58D. These new and modernized systems were very costly, revolutionary in their design, and were fielded using the total systems' approach for the first time. Of course other non-aviation systems were being fielded at the same time and organizational changes associated with the emergence and recognition of Aviation as a combat arm also complicated modernization during the period. Maintenance concepts had to be changed because the new aircraft systems were multi-system configured, were sophisticated and approached complexity of modern Air Force fighters and bombers.

Fielding of the Blackhawk and the CH-47D went very well in the late 70's and early 80's. Production and fielding plans for the Apache and the

OH-58D are also progressing on schedule. The Blackhawk had minor fielding problems but these were solved without major fielding delays. Even a lengthy grounding of the Blackhawk in 1984 did not produce serious criticism of the system or of Army Aviation in general. The grounding was a safety measure to study causes of an accident and to determine if a systems fix was necessary. The cause was identified and a fleet fix prescribed. Blackhawk aircraft throughout the Army were modified and the fleet grounding was lifted. Total readiness of the fleet was invisioned to be even better after the grounding than before because minor maintenance postponed prior to the grounding could be accomplished during the grounding. This was not the case, however. After the grounding it was discovered that so much deferred maintenance had accumulated that the maintenance effort could not be completed during the grounding and many aircraft were now grounded for reasons other than the fleet grounding. Readiness suffered and senior officials began to ask why. As a result, the Army Material Command, AMC, was tasked to study UH-60 readiness in general and determine causes and possible fixes to a perceived maintenance and resource problem. The AMC study recognized several areas that needed further study and specifically pointed toward possible problems with the method used in the Army to determine maintenance manpower requirements and the way that maintenance personnel are managed in units.

As a result of the AMC study it was determined that a more indepth study was necessary. Training and Doctrine Command, TRADOC, was tasked by DA, DCSLOG to head a study working group that would include elements of AMC and FORSCOM to examine in detail reasons that would cause excessive maintenance backlogs and decreased readiness for the Blackhawk.[1] The group

of the on-going AH-64 fielding. The TRADOC study planned exploration into the four major areas listed below:

1. Maintenance concepts
2. TOE Development
3. Maintenance Training
4. Manpower Management

It is the purpose of this project to describe the findings, conclusions and recommendations of the TRADOC Aircraft Maintenance Study Group.

TRADOC STUDY

TRADOC further tasked the Aviation Logistics School (USAALS) Fort Eustis, to conduct the study. USAALS was given TRODOC and DA, DCSLOG tasking authority and assembled a group of experts representing FORSCOM, DCSLOG, HQ, AMC, the Logistics Center, the Combined Arms Center, and HQ, TRADOC. The group met several times and organized the study into the following outline:

1. Maintenance Concepts
2. Manpower Determination Process
3. TOE Process
4. Training
5. Manpower Management

Manpower Determination Process was added as an area separate from TOE Development because of the complexity of the Process even before results became organizational documents.

It is the purpose of this essay to review the on-going TRADOC Aircraft Maintenance Study, examine other relative issues, and provide recommendations to improve the Army Aircraft Maintenance System.

MAINTENANCE CONCEPTS

The first area explored was aircraft maintenance concepts. Aircraft Maintenance is somewhat different from maintenance of other army systems and has evolved over the years from a four level system used in the 60's to the present three level system of organizational, direct support and depot. Two areas involving maintenance concepts that may have had a negative bearing on maintenance readiness were explored. The first involves transition from the Periodic to Phase Maintenance Program. The Phased Maintenance Program expands the time between inspections and transfers many inspection requirements to the mechanic. Under the Periodic Maintenance Program the initial and post-flight inspection of the aircraft were performed by the Technical Inspector, TI, who was accompanied by the crewchief or mechanic. This system provided a valuable source of on-the-job OJT training in that the crewchief or mechanic received the benefit of the knowledge and experience of the the TI. Under the Phased Maintenance Program, the initial inspection is performed by the crewchief or mechanic and the Post maintenance inspection and the inspection of safety-of-flight faults is performed by the TI. The practice denies the crewchief and mechanic a valuable learning experience and source of OJT. Additionally, crewchief and mechanic experience is further reduced under the Phased Maintenance Program because of the increased time between inspection under the peacetime flying hour program which is significantly lower than what would be flow in wartime. This situation could lead to possible lower productivity, and an increase of deferred maintenance and undiscovered faults. This was confirmed within FORSCOM when ARMS inspections in 1985 grounded approximately 50% of inspected aircraft due to undiscovered maintenance.[2]

The second maintenance concept explored was the passback of excess aircraft maintenance workload from division to non-division Aircraft Intermediate Maintenance AVIM units. This doctrine was instituted in order to reduce manpower requirements in division AVIM TOE. The passback amount as shown below varies from 14% in the Air Assault divisin to 21% in the light division. In order to insure "lightness" in the light division an additional 25% passback was included. The light division passback was re-sourced with corps augmentation, but no provisions have been made at the corps level for the initial passback. This excess workload could contribute to increases in the volume of deferred maintenance and backlog.[3]

UNIT	PASSBACK	EXCESS	TOTAL
Light Division	25%	21%	46%
Airborne Division	25%	16%	41%
Air Assault Division	25%	14%	39%
Army	25%	-	25%

Figure 1 Aircraft Maintenance Passback

MANPOWER DETERMINATION PROCESS

Army maintenance manpower requirements are determined by a deliberate process that determines workload for each function performed and converts the data to numbers of personnel in specific skills required to perform all required functions. This process has evolved from a 1975 Manpower Authorization Criteria MACRIT Program to the current Manpower Requirements Criteria, MARC, Program. The new criteria is proving to be a good measure of maintenance requirements. The problem has to do with the fact that most of our aviation TOE have not been updated to the MARC and are still under the older MACRIT. The Process of converting to MARC is cyclic and requires two years for all aviation TOE to be affected. [4] Additionally, for new systems like the UH-60 and the AH-64, maintenance manhours per flying hour data used in the MACRIT and MARC formulas are determined by a Logistics Support Analysis, LSA, conducted by the manufacturer and the AMC Project Manager and may be optimistic. This would produce understated manpower documents. Data used to update the MARC is manually gathered through a sample data collection, SDC, effort. It is a contract effort at selected CONUS posts and has been criticized for not being totally accurate because it records only completed work at each level of maintenance and does not capture deferred work at organizational levels that is accomplished as part of maintenance work-ordered to intermediate level.[5] Total work is captured but it is not always recorded at the appropriate level and can skew manpower requirements. It is also felt that validity of the maintenance data could be enhanced by the use of automation in the collection effort. The new automated logbook program is being considered for use in the SDC process.[6] Also neither the MACRIT nor the MARC are subjected to

wartime conditions. Wartime scenarios predict losses to enemy fires that would reduce maintenance and recovery operations will increase maintenance requirements. In 1985, the US Logistics Center Produced a computerized wartime scenario to which MARC data could be subjected and although further refinement of the program must be accomplished, the concept promises to produce a true determination of wartime personnel requirements for aircraft maintenance. A refinement of the LOG center MARC Military Occupational Specialties MOS and subject the changes to the combat maintenance scenario. Numerous iterations are completed until an optimum mix of MOS emerges. In this way maximum maintenance effort is realized using the original TOE complement of personnel.[7]

The use of automation in the collection effort, a wartime scenario to refine MARC data, and more accurate initial data for new systems will increase the credibility of MARC data.

TOE DEVELOPMENT

MARC data is the primary factor in determining support organizations to maintain Army material. The Table of Organization and Equipment TOE is the document that reflects wartime manpower requirements for Army organizations. There are two problems with current TOE for Army aviation units. The first of these is that TOE are designed for wartime requirements and that peacetime maintenance needs are different. It may be assumed that wartime maintenance manpower requirements are more that peacetime because flying hours are significantly greater in wartime. This is not the case. First of all there is a base maintenance requirement even if aircraft are not flown. And secondly, many peacetime soldier training tasks and off-duty distractions significantly reduce the amount of time soldier mechanics are available to work on aircraft. The need for accurate peacetime maintenance requirements will be explored later in this report. The other problem is not a factor in the case of UH-60 organiztaions but will possibly influence AH-64 units. This problem is tha manpower requirements determined using MARC factors in the TOE process are arbitrarily reduced based on current Army manpower and budgetary constraints. In 1985, the Army of Excellence, AOE, TOE manpower ceiling required reductions in all functional areas equally to create spaces for Light Infantry Divisions. Safety and maintenance requirements were not significant enough to exempt aviation TOE from the AOE reductions. AOE reductions coupled with expected percentages of fill being less than 100% and AOE Aviation organizations may be staffed well short of actual maintenance requirements. The figures below represent a TOE for a Combat Aviation Company with fifteen UH-60 aircraft. It clearly points out the dilemma facing the resources of aviation and aviation maintenance units.

The only AOE units actually operating are the AH-64 units being formed at Hood. Upon interviewing several Aircraft Maintenance Officers and Aircaft Maintenance Technicians in newly formed attack battalions it was a consensus that the TOE were inadequate to support aircraft assigned. Specifically, the MOS mix was probably not appropriate for either peacetime or wartime. For example, the number of structural repairers, 68G were excess for peacetime because there is very little sheet metal repair but in the opinion of those interviewed would be inadequate for wartime where structural repair is the major function in battle damage repair. These comments support the LOGCEN optimum mix TOE process and the need for a peacetime influence of our maintenance organization.

COMBAT AVIATION COMPANY

TOE 01103L200

MARC REQUIREMENTS	TOE (AOE CONSTRAINED)	AVERAGE ASSIGNED	PERCENT FILL
54	43	40	74

Figure 2 TOE Manning verses Maintenance Requirement

AIRCRAFT MAINTENANCE TRAINING

Even if TOE are adequately designed and manned, soldiers must be well trained in the highly critical and technical area of aircraft maintenance. All aviation mechanics for UH-60 and AH-64 are trained at the Army Aviation Logistics for School at Ft. Eustis, Va. The mechanic is trained to perform at the doer level and field comments and surveys indicate that the current graduate is adequately trained. There was one finding that for new systems, aircraft and configuration changes at the training center do not keep up with changes made in the field. The result is that the mechanic is trained on one system and sees a new configuration in his unit. It was also pointed out that in some cases skills learned in the school were lost by the time a soldier was placed on the job. Leave following training, unit in processing, in-unit training and "new guy" details contributed to delays in application of newly acquired skills.[8]

RESOURCE UTILIZATION

Studies conducted by COBRO Corporation, the Army Soldier Support Center and FORSCOM indicate that the aviation mechanic is available for productive "wrench turning" work only approximately 31% of an eight hour peacetime day. One reason for this low availability is that the soldier is performing many tasks that are important to the day-to-day operation of the unit, but do not contribute to the maintenance mission. The chart below reflects the finding of the FORSCOM study and the results are supported by similar Soldier Support Center surveys and an AVSCOM sponsored COBRO study. These figures represent real world availability of soldiers but two other problems exist that point out other incongruences in aviation organizations and requirements. The first is the fact that peacetime availability factors are neither included in TOE development nor are they used to determine the need for manpower resources to supplement wartime organizations in peacetime when necessary. A solution to this problem sould be to determine a reasonable peacetime soldier requirement for different types of units and compare that requirement to wartime TOW and the resulting soldier availability factors for the TOE. If it is determined that the requirements exceed the resource availability then it will be necessary to supplement the TOE with a peacetime augmentation of some type of such additional TDA personnel, contract maintenance of air resources are not available then it may be necessary to reduce the number of flying hours a unit flys or the number of aircraft assigned. There is danger in reducing aircraft or flying hours in that there is a minimum amount of hours required to support aviator proficiency flying.

The second problem is that of reducing the soldier distractors. Training is a given and will just have to be accepted as part of the daily activity of a soldier, but guard duty, details, time off for errands can probably be reduced with command emphasis. It is probably cost effective to contract guard requirements and exempt mechanics from other duties that would take them away from maintenance.

ACTIVITY	AVERAGE DAILY AVAILABLE
Training	15.1%
Indirect Labor	18.4%
Direct Labor	30.7%
Non Productive	35.8%

Figure 3 Peacetime Aircraft Mechanic Availability

CONCLUSIONS

The study of concepts and processes that make-up the Army's aircraft maintenance system involved all major commands pointing out the importance of a system in general and specifically the need for Army aircraft to be maintained efficiently and effectively not only to insure maximum firepower in wartime, but to provide appropriate safe training in peacetime.

Maintenance concepts explored were generally adequate, however minor changes to TI and mechanic inspection procedures could improve OJT for mechanics and increase mechanic efficiency. In peacetime, passback maintenance to corps level at posts where a corps maintenance facility is not located will have to be resourced either by additional TDA augmentaion personnel at post level or through contract maintenance.

The manpower determination process has some flaws. It depends heavily on manufacturer data for initial maintenance requirements. The SDC process does not capture all maintenance performed and could be more accurate if linked with an automated logbook system.

The TOE development system is lengthy, forcing units to operate under outdated TOE for two or three years while new documents are developed. The AOE TOE are decremented below document requirements because of Army manpower constraints. AOE TOE maintenence personnel shortfalls could lead to maintenance related aircraft systems failures.

Army aircraft maintenance training is adequate, but more timely distribution and application of engineering changes to training center

aircraft will improve training. And employment of new aircraft mechanics as soon as practical after assignment is critical to retaining recently acquired skills.

Peacetime detractors prevent full utilization of trained aircraft mechanics in units. When these detractors are considered, TOE developed for wartime requirements may not be adequate for peacetime requirements. Accurate peacetime maintenance factors hae not been developed by the Army. These factors are key to determining supplement requirements if TOE fall short of peacetime maintenance requirements.

RECOMMENDATIONS

Efforts to solve many of the problems explored herein are already ongoing, but there are still shortcomings in the Army aircraft maintenance systems that must be corrected.

AVSCOM and the ALS are working closely together to improve the training base by promptly applying ECP to training center aircraft and updating publications accordingly. This will insure that mechanics arriving in units from schools can expect to see aircraft configured the same as those upon which they trained and manuals in units and in training centers will be the same. AVSCOM is exploring changes to maintenance procedures that will facilitate a closer working relationship between the unit TI and line mechanics to take full advantage of a valuable source of OJT for the mechanics.

AVSCOM is also striving to improve the SDC process. The aviator's maintenance automated logbook has been treated, works well and can be used to assist in the SDC process. It is hoped that more accurate data can be captured to portray a true aviation maintenance manpower requirement.

The maintenance passback issue is yet to be solved for peacetime operations. Reducing flying time or aircraft in units are not solutions because of readiness requirement, so the only alternative is to resource the excess maintenance or passbook. If we assume that the TOE will continue to be constrained by AOE guidelines, then additional money for TDA augmentation or contract maintenance must be authorized. A vital ingredient in determining the amount of maintenance that must be planned for

is a peacetime maintenance factor. It is recommended that AVSCOM contract on effort to determine the critical factor and specify its application in planning for TDA or contract maintenance resources.

The TOE documentation process must be st·eamlined. Wartime MARC factors are good and getting better but the time to develop and field TOE is too long and must be reduced. TRADOC is proponent and must provide a more responsive system that allows a factor update time for TOE praticular TOE for new systems.

The Army must recognize the impact on safety and maintenance that AOE constraints have placed on aviation TOE and the fact that the shortfall that results must be resourced.

Of equal importance is the need to reduce the time soldier mechanics spend away from their primary duty. Non-productive time can be decreased and is a function of command effectiveness. Special rules of employment must apply to soldier whose peacetime function is the same as wartime. A new look by commanders at all levels to guard functions, details and time off is in order. Additionally mechanics must be utilized as soon after assignment as possible to reduce the occurance of skill delay.

ENDNOTES

1. HQ, Department of the Army Message, Subject: Aviation Maintenance Personnel Authorization and Utilization (UH-60, AH-64). 302036 Jan. 1986.

2. Don Marshall, FORSCOM Force Management Office, AFLG-FMA, McPherson, Ga.

3. Department of the Army, Field Manual 1-500, pp. 1-5, 3-7.

4. Matthew Maney, U.S. Army Aviation Logistics School, Ft. Eustis, Va.

5. Ray Pearce, U.S. Army Aviation Systems Command, AMSAU-MMD, St. Louis, MO.

6. Ibid.

7. Tom Lavagan, U.S. Army Logistics Center, ATCL,-DMM, Ft. Lee, Va.

8. Department of the Army, Users Manual for Predicting Military Training, 13 Aug. 1985, p. 62.

END

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